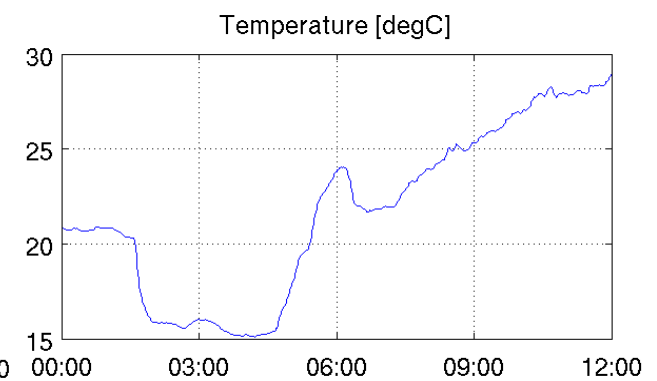
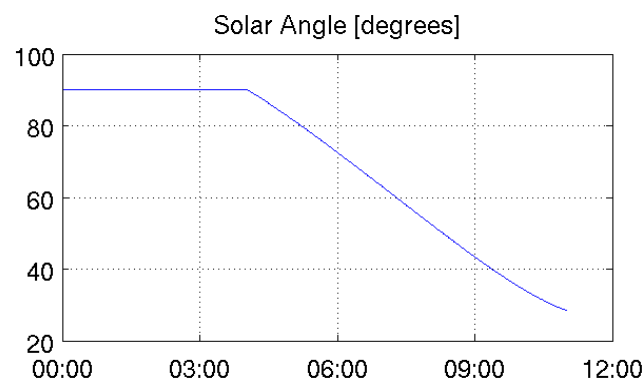
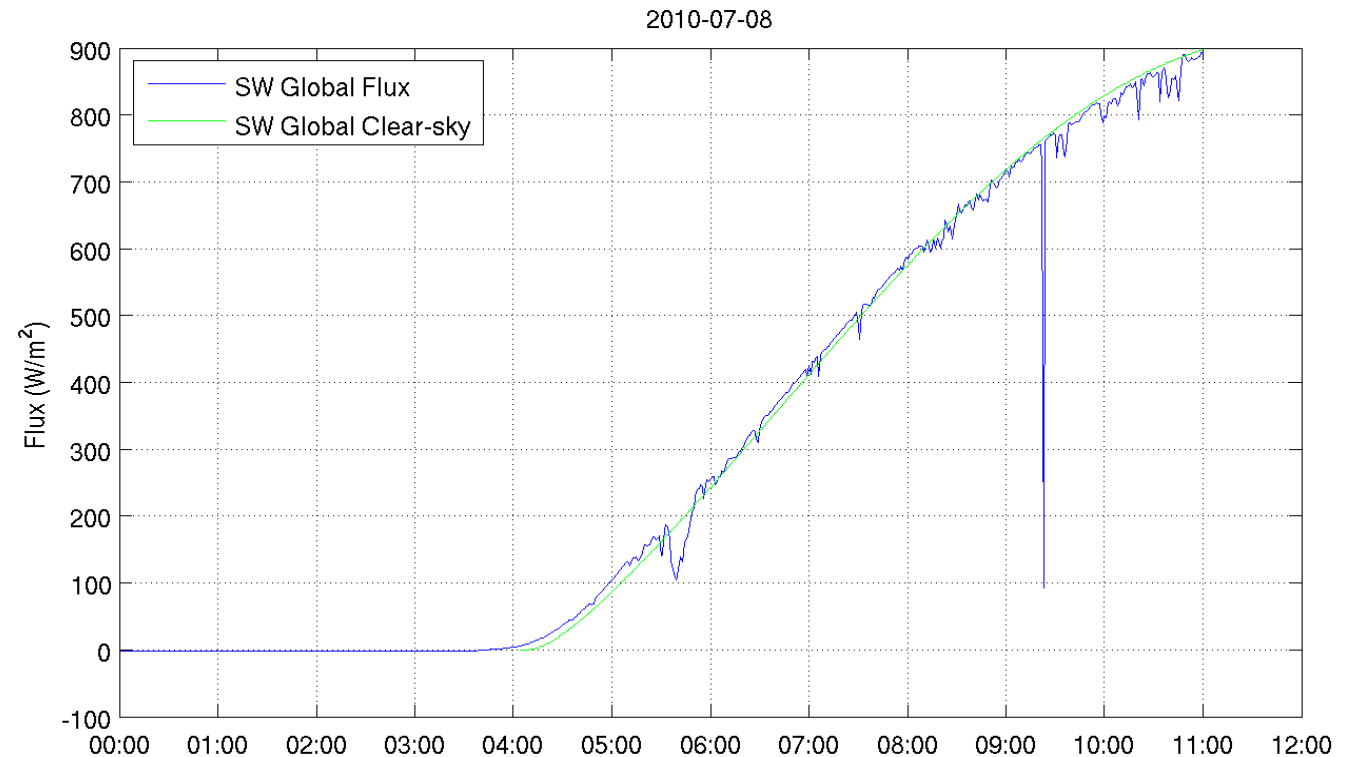


# Radiative budget and green-house effect

*– Students restitution –*

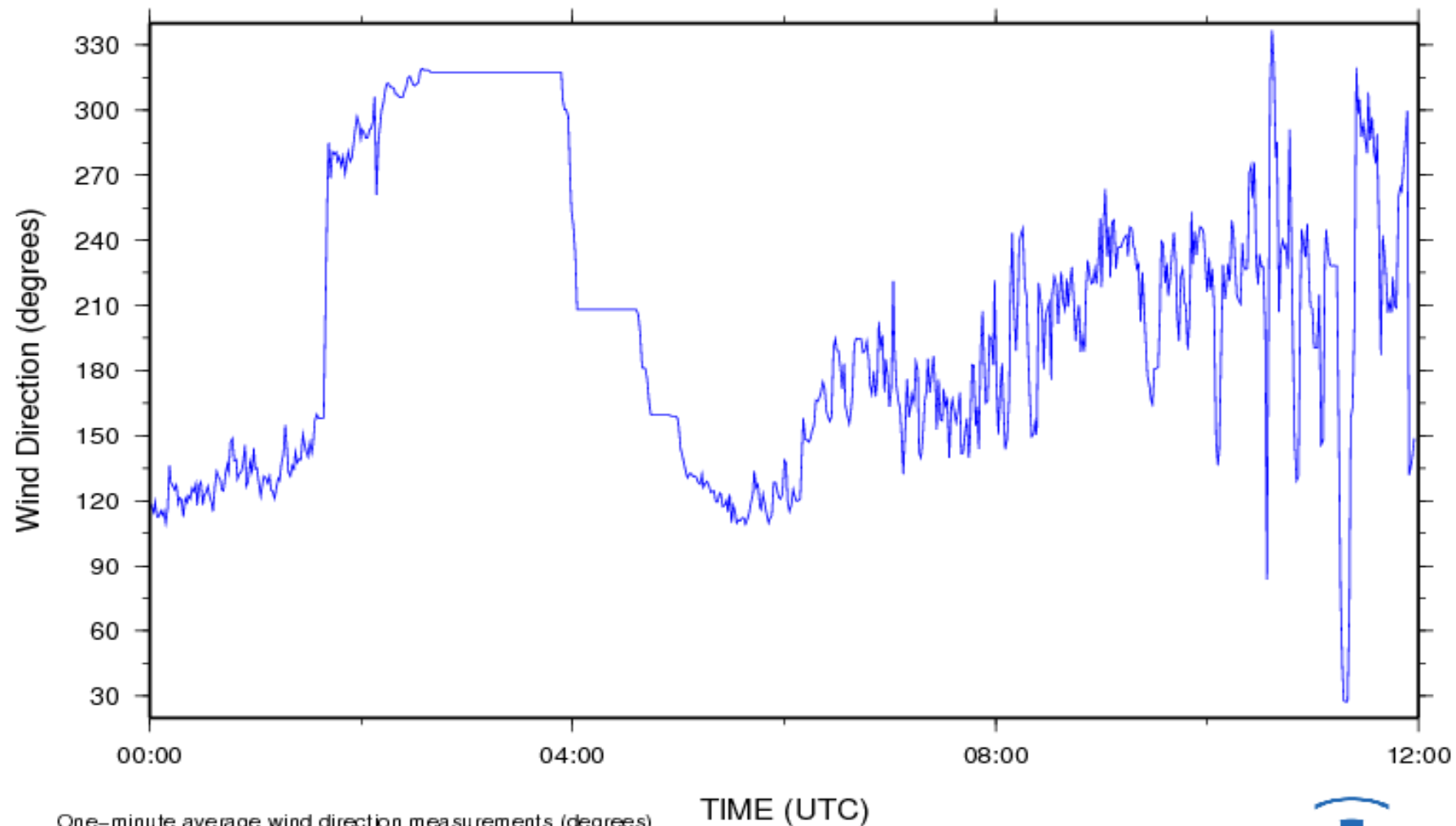
*08 July 2010*

- Time Vs. Flux
- Sun Rise
- 1<sup>st</sup> decrease in flux
- 2<sup>nd</sup> decrease in flux
- 1<sup>st</sup> decrease in temp
- 2<sup>nd</sup> decrease in temp

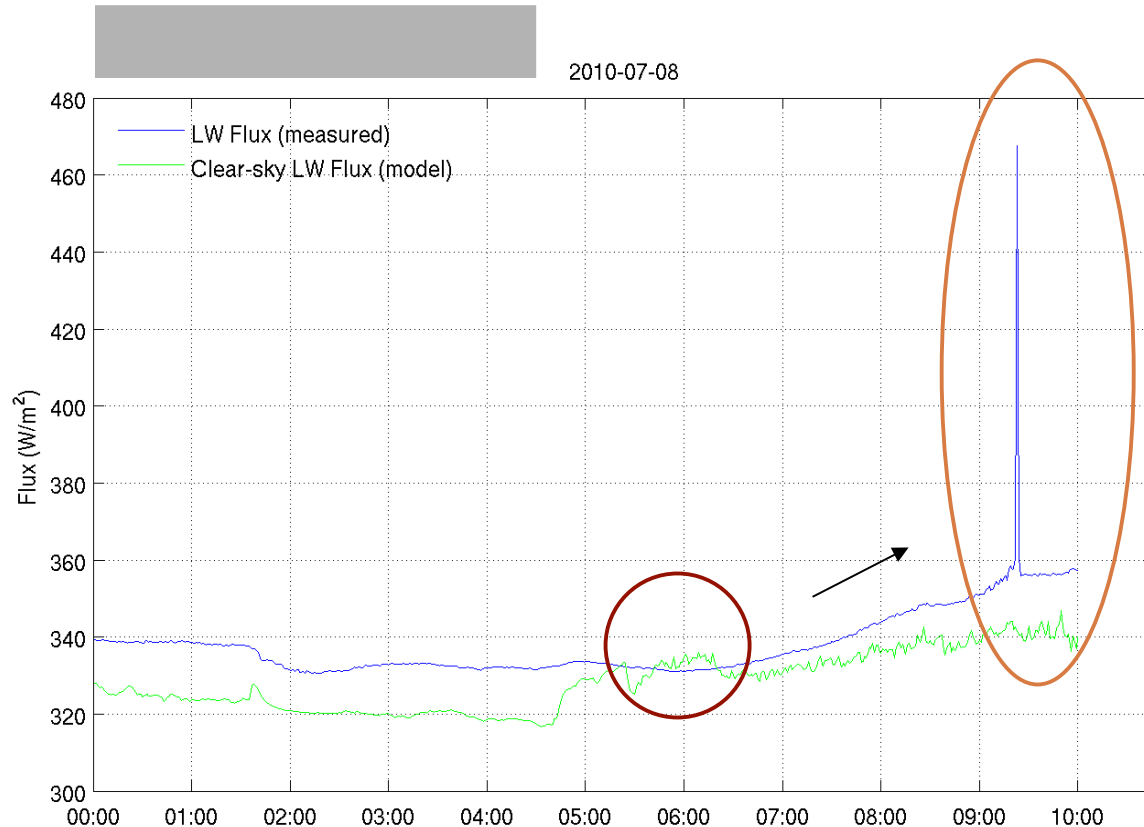


## Wind Direction

2010/07/08



One-minute average wind direction measurements (degrees)  
performed at SIRTA, Palaiseau, Zone 2 (48.7N,2.2E).

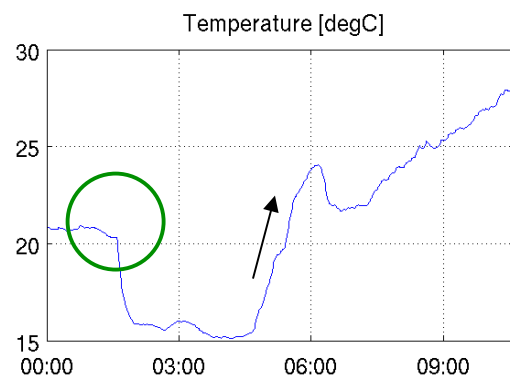
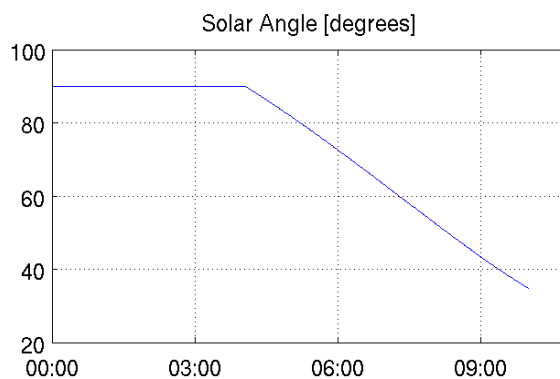


When the sun rises so the earth surface heats up

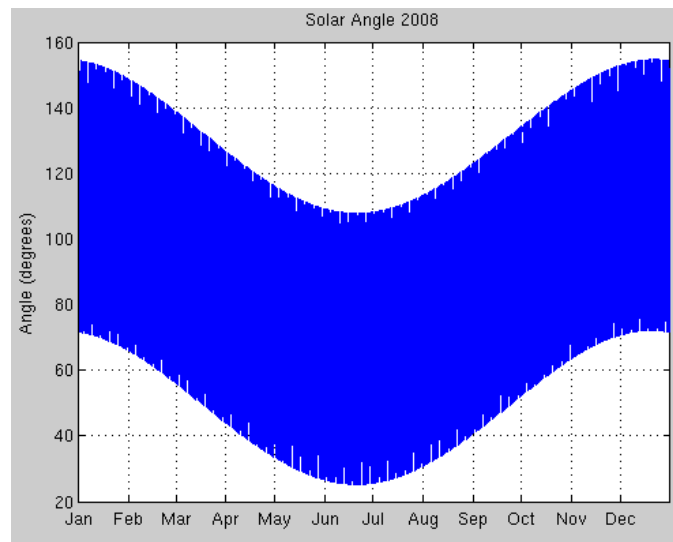
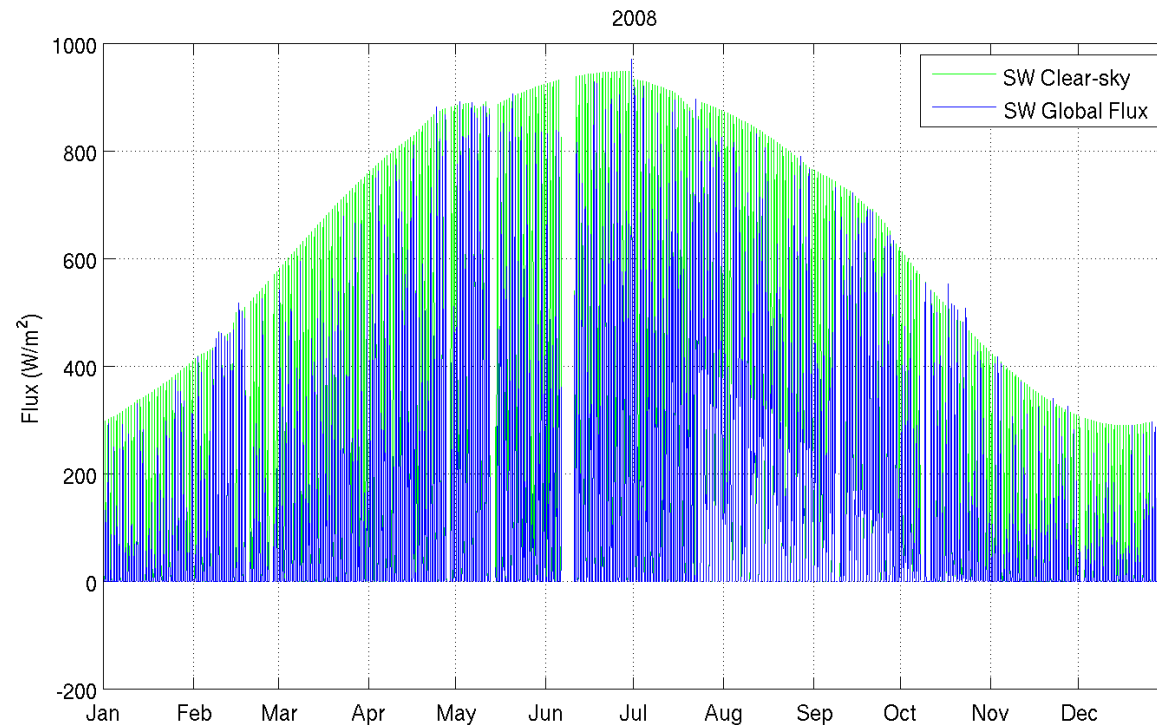
○ Hand emits infrared radiation

○ ???

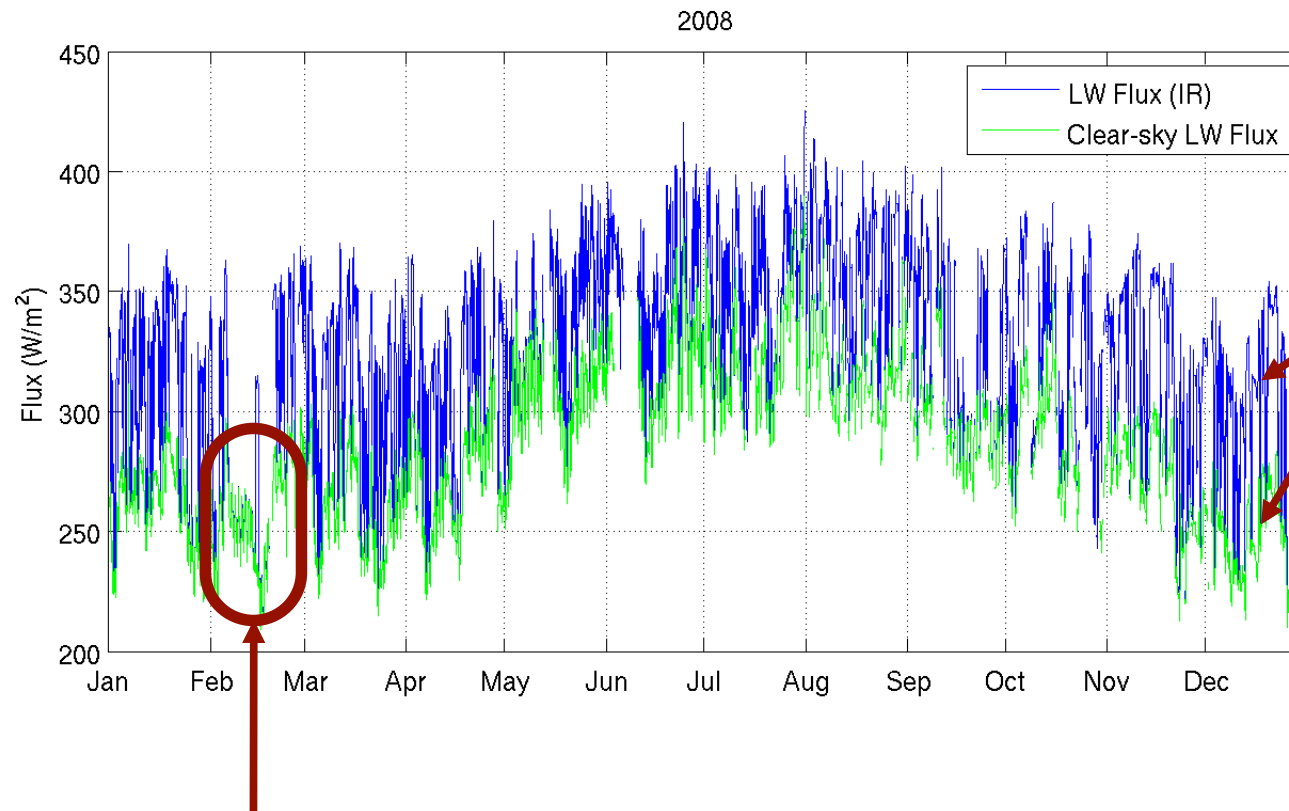
○ Change in wind direction (cold northern wind)



- Seasonal variations in SW radiation due to differing angles of the Sun to the Earth

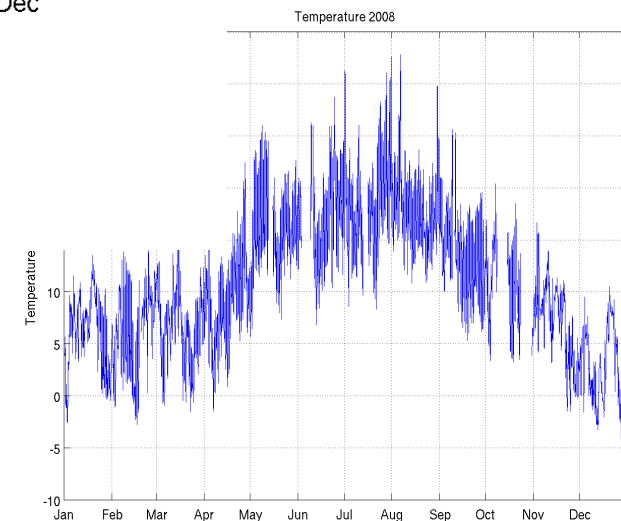


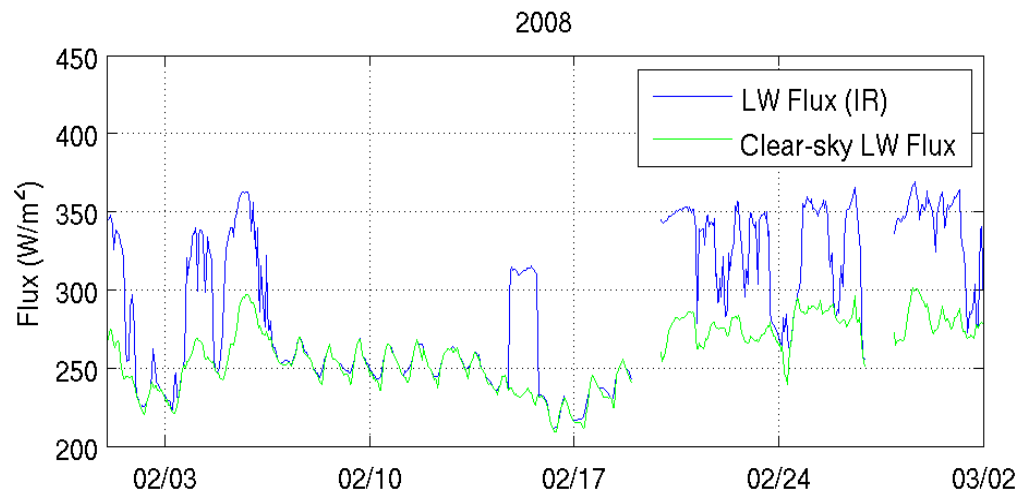
- Difference between clear sky and global flux illustrates daily cloud cover
- Cloud type affects reflective properties (up to ~85%)



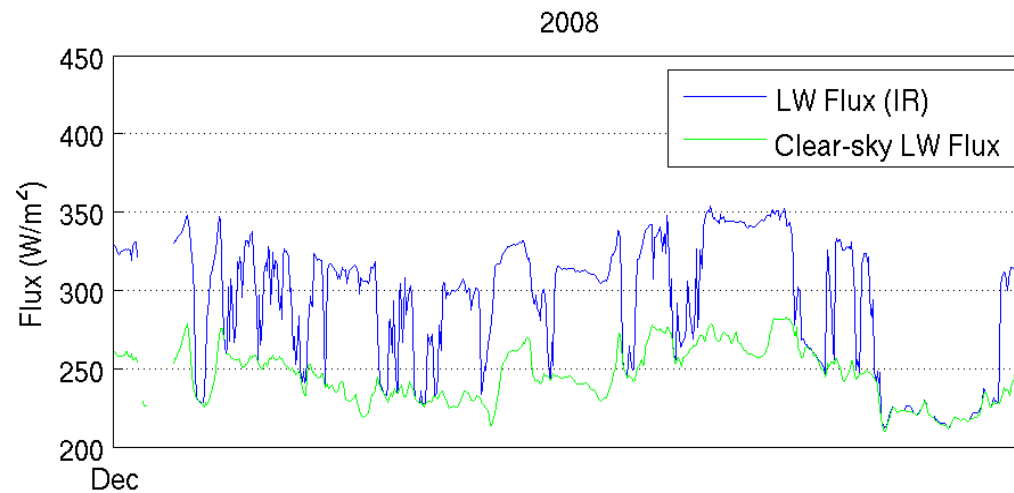
On cloudy days:  
more long-wave  
flux is re-radiated  
to the surface

- On clear days: observed flux matches clear-day model
- Long-wave flux is proportional to temperature
- Seasons can be distinguished





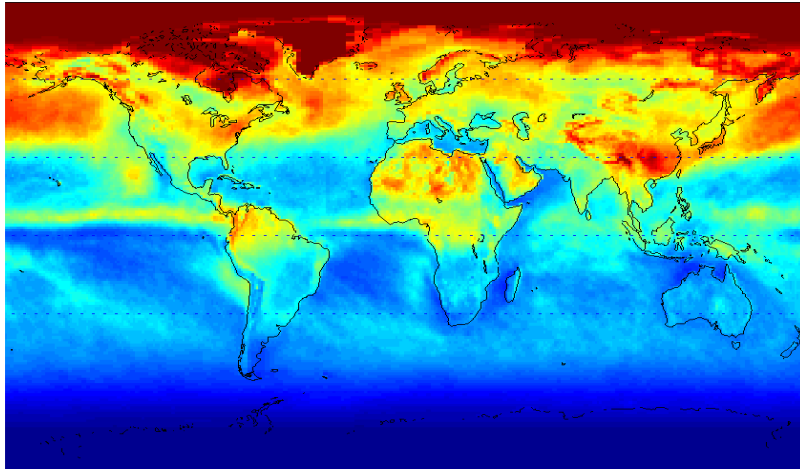
February



December



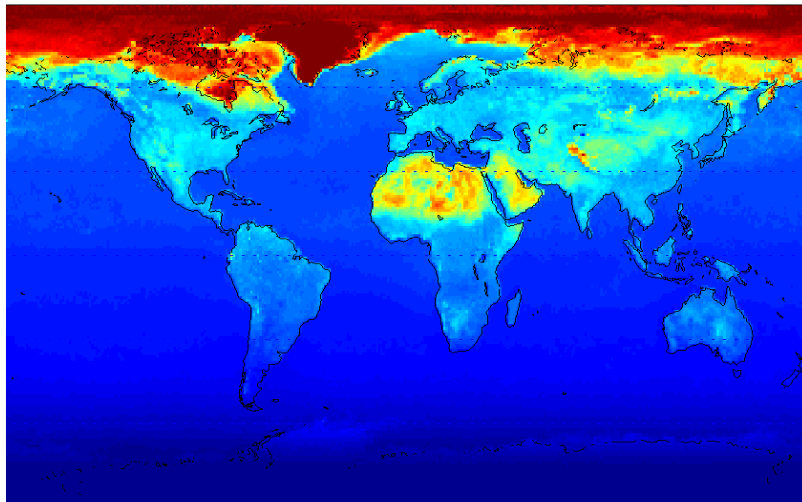
Apr-May-Jun 2008



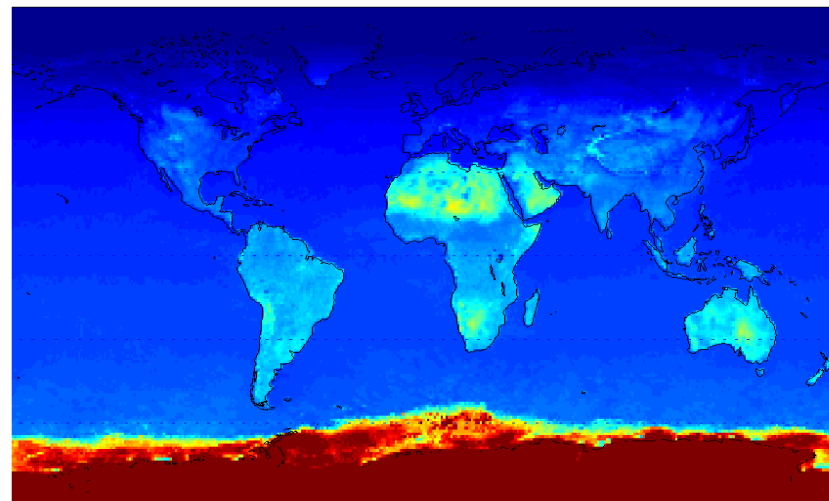
- .The complete short-wave global flux
- .Clouds form above warm sea areas
- .Monsoon in India

- .Clear sky fluxes show clearly the reflection from the ground
- .Deserts
- .Glaciers

Apr-May-Jun 2008



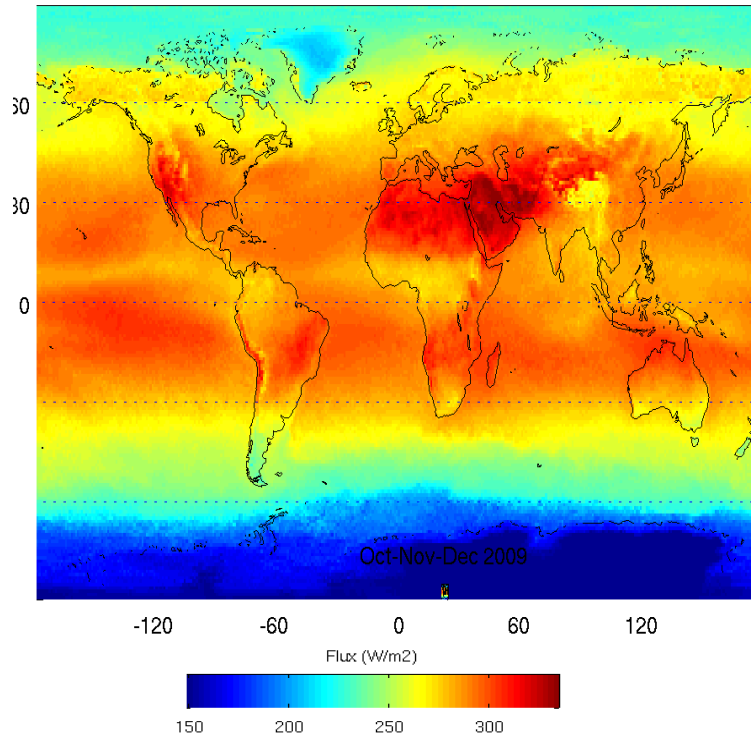
Oct-Nov-Dec 2008



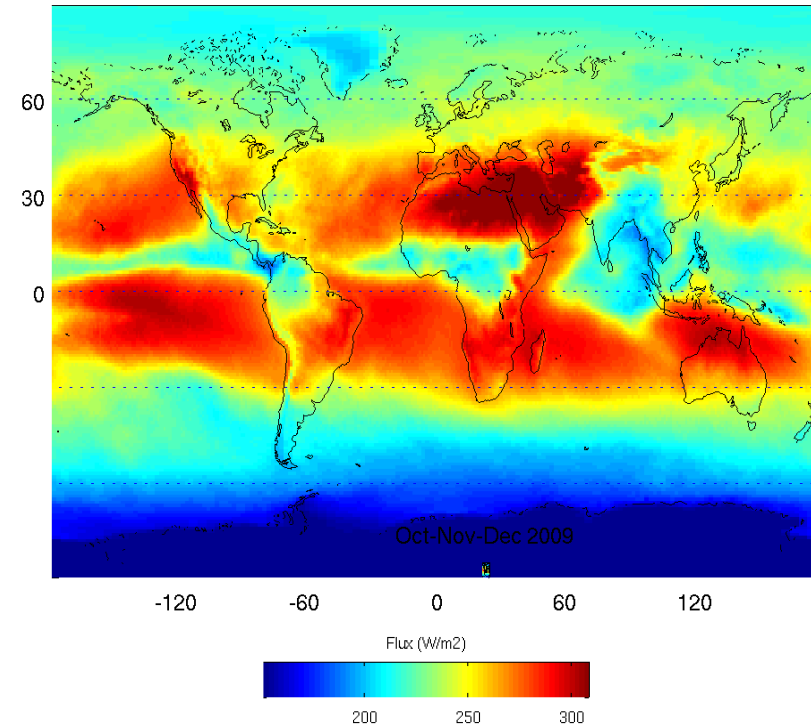
-120 -60 0 60 120



Jul-Aug-Sep 2009

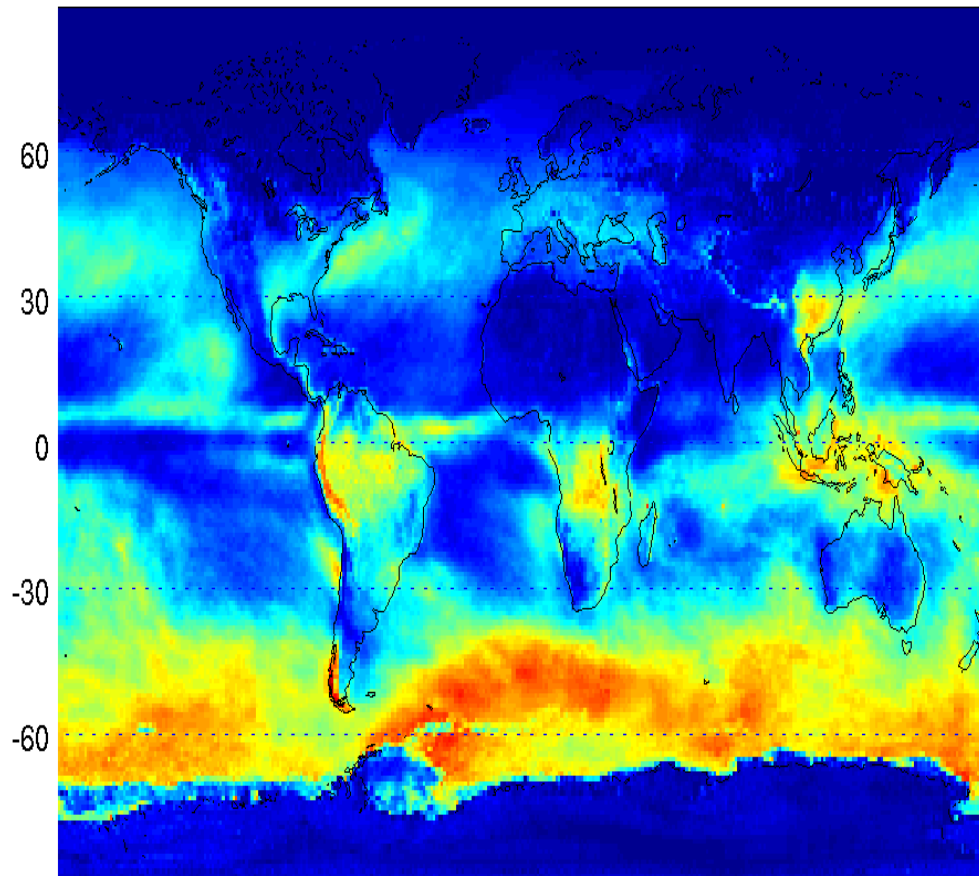


Jul-Aug-Sep 2009



- On the clear sky image, we can visualize several aspects of the relief : mountains, deserts, forests and ice.
- On the all-weather image, we can visualize the effects of clouds absorbing the surface flux.

DIFF  
Jan-Feb-Mar 2006



Shows the difference in short-wave reflection from clear sky model

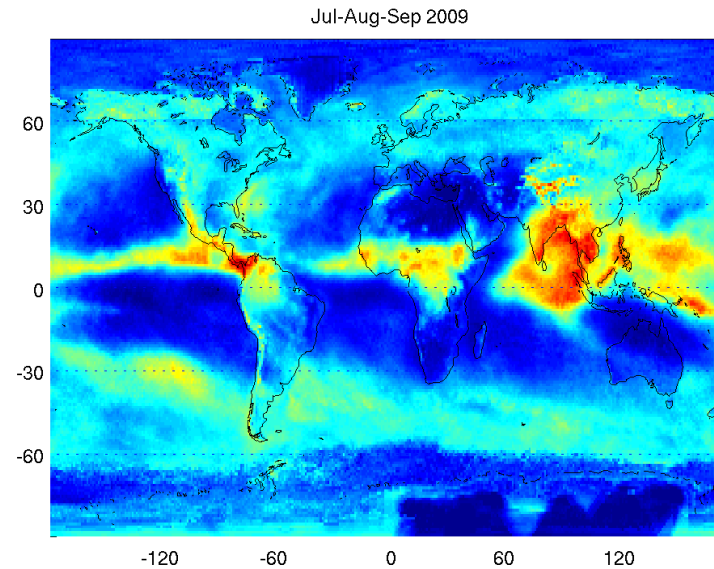
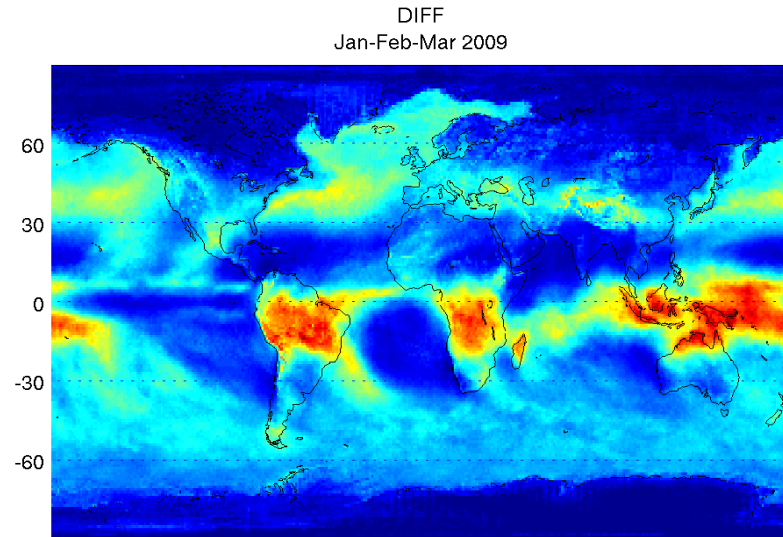
Seasonal effects on conditions:

- No sun shine at Arctic
- Raining season belt in Africa, Amazon region and South-East Asia

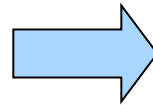
Effects of different weather conditions show clearly:

- Weather front north of Antarctic
- Snow in Andes
- Possibly warm sea water evaporation in Indonesia

## 8. Global maps of cloud radiative forcing for long-wave



$$\text{CRFLW} = F_{\text{clearLW}} - F_{\text{totLW}} > 0$$



Greenhouse effect

- $\text{CRFLW} > 0$  because part of the LW radiation is re-emitted towards the surface
- Difference between clear sky and normal sky increases  $\rightarrow$  GH effect increases
- Season difference

9. **Brainstorm:** are radiative fluxes the only important variables for climate prediction?